

PROJECT FICHE . BL/10/V26

LAND USE CHANGE UNDER IMPACT OF SOCIO-ECONOMIC DEVELOPMENT AND ITS IMPLICATIONS ON ENVIRONMENTAL SERVICES IN VIETNAM

(Geographic) study area (country/region) : Vietnam

Northern Vietnamese Highlands
Red River Delta

Context and objectives

This four-year bilateral project will study land use change in two contrasting regions, the Northern Vietnamese Mountains and the Red River Delta. Remote sensing data have proven to be effective land use change monitors, especially in poorly accessible, remote areas; and offer opportunities to document land use change for a wide variety of environments. However, off-the shelf technology does not always allow detecting significant changes, especially in areas with steep topography and/or a strong landscape fragmentation. The large spatial heterogeneity in land dynamics that is observed in Vietnam, and the presence of important local gradients in socio-economic development and environmental degradation afford an opportunity to unravel several key questions regarding socio-economic and environmental controls and feedbacks of land use dynamics in two contrasting regions.

More specifically, this project aims to evaluate land use change under the impact of socio-economic development using novel techniques, and to assess its effect on environmental services as well as on local climate. Through applied research, this project will contribute to improve the capacity of Vietnam National University, Hanoi in the field of applied research on climate change impacts and to promote the cooperation between Vietnam and Belgium on R&D for local sustainable development, in a global climate context.

The project activities are targeted to improve the capacities of Vietnamese partners in advanced image processing techniques (cognitive and fuzzy classification, pre-classification change detection) applicable to the land use change patterns detection. In terms of modelling, VNU-HNs desires to develop its capacities in spatial modelling techniques that allow to include socioeconomic data will be integrated with the effect of land use change scenarios on GHG emissions.

Methodology

The Work Packages are defined according to the interrelation of the expertise required for the different subtasks, and according to the sequence in which these tasks have to be carried out by the workplan.

WP1: Detection of different pathways of land use change

- A : Selection of study region
- B : Acquisition of Remote Sensing data
- C : Remote sensing data processing

WP2: Evaluation of advanced techniques for image analyses

- A : Development of land cover classification and land cover change techniques
- B : Development of parameter inversion techniques

WP3: Analysis of socio-economic and environmental factors controlling land use dynamics

- A : Selection of three villages in Northern Vietnamese Mountains
- B : Interviews with local farmers
- C : Collection of socio-economic data
- D : Analysis of factors controlling land use dynamics

WP4: Impact analysis of land use change on services provided by the ecosystems

- A : Collection of data on forest type and density
- B : Collection of field data on natural risks
- C : Collection of field data on blue water production
- D : Impact analysis

WP5 : Impact of the land cover change on the local climate

- A : Impact of the land cover change in the evapotranspiration
- B : Simulations of the different scenarios

WP6 : Training and dissemination

- A : Kick-off meeting and field surveys in Vietnam
- B : Technical visits and mid-term workshop in Vietnam
- C : Training of 2 PhD students in Belgium
- D : Visits of Vietnamese Junior experts to Belgium
- E : Extended project workshop

WP7 : Reporting

Scientific Results

WP1: Detection of different pathways of land use change

Forest cover change map (1993-2006) for Northern Vietnam based on high-resolution RS data (30m res)
Land cover change map for Red River Delta (2001-2010) based on MODIS data (500m res)
Joint presentation at international conference on Sustainable Land Use and Rural Development (Hanoi, 2010)
Joint publication on 'biophysical and socio-cultural factors of land use transitions' submitted to peer-reviewed journal (Human Ecology)

WP2: Development of advanced techniques for image analysis

Joint presentation at Canadian Symposium on Remote Sensing (Canada, 2011)
Joint presentation at IEEE Int. Geosciences & Remote Sensing Symposium (Canada, 2011)
Processing of MODIS images for production of land cover change maps (see Annual Report)

WP3: Analysis of socio-economic and environmental factors controlling land use dynamics

Joint publication on 'Drivers of forest cover dynamics in smallholder farming systems' submitted to peer-reviewed journal *Ambio*
1 M.Sc. Thesis (2011) on drivers of forest cover change in NW Vietnam

WP4: Impact analysis of land cover change on services provided by ecosystems

1 M.Sc. thesis (2011) on impact analysis of land cover change on landslide risks
Joint presentation at international conference (IGC Köln, 2012)

WP 6 : Training and dissemination

Technical visit of Vietnamese junior expert to KULeuven (Dr. Kim Chi Vu, June-August 2011)
Kick-off meeting (Belgian promoters to Vietnam, April 2011)
Technical mission – Belgian promoters to Vietnam (April 2010, November 2010)
Visit of Vietnamese delegation in Belgium (November 2010)

WP7: Preparation of initial, and semestrial reports

Products and services (if applicable: maps, database, peer reviewed article(s),weblink...)

- FTP Data server : <ftp://ftp.etro.vub.ac.be>

- International conference proceedings:

Chi, K.C., Van Rompaey A., Govers G., 2010. Causes and effects of the land use change in the Suoi Muoi catchment, Son La, Vietnam. International Symposium on Sustainable Land Use and Rural Development in Mountainous Regions of Southeast Asia, June 2010, Hanoi.

Balthazar V, and Vanacker V, 2011. Remote sensing techniques for landslide detection, and their efficiency according to different pre-processing levels of high-resolution satellite data. Geophysical Research Abstracts, Vol. 13, EGU2011-7975, 2011.

Pham Van Cu, Le Minh Phuong, Tong Thuy Ai, Pham Thanh Hai, Pham Minh Thang. 2011. Characterization of the urbanization of Hanoi using remote sensing and urban form metrics. 32th Canadian Symposium on Remote Sensing, Sherbrooke, Canada 13-16 June 2011

Ye Runqing, Niu Ruiqing, Jiang Qiying, Hichem Sahli,"Soil Thickness zonation approach using Landsta ETM+, Geological Maps, DEM data and Field Investigation", IEEE Int. Geosciences & Remote Sensing Symposium, IGARSS2011, 2011.

Balthazar, V., Clapuyt, F., Vanacker, V., 2012. Effects of preprocessing techniques on landslide detection based on High-Resolution (HR) remote sensing data. ICG Conference Köln.

- International peer review publications :

Jadin, I., Vanacker, V., Hoang H., submitted (Feb 2012). Drivers of forest cover dynamics in smallholder farming systems: the case of Northwestern Vietnam. *Ambio*.

Vu, K.C., Van Rompaey, A., Govers, G., Vanacker, V., and Nguyen, H., submitted (Feb 2012). An integrated analysis of biophysical and socio-cultural factors of land use transitions in NW-Vietnam. *Human Ecology (Special issue of shifting cultivation)*

- M.Sc. theses :

Jadin, I., 2011. Comment la repartition spatiale et les caracteristiques socio-economiques des communautes ethniques sont-elles liees { la dynamique temporelle de l'utilisation du sol des vingt dernieres annees dans les alentours du Parc National Hoang Lien? M.Sc. thesis, Faculty of Sciences, Université Catholique de Louvain.

Clapuyt, F., 2011. Study of controlling factors of landslides in the northern mountainous area of Vietnam, SaPa district, Vietnam. Focus on land use changes and detection on ASTER images. M.Sc. thesis, Faculty of Sciences, Université Catholique de Louvain

- Others : Research cooperation generated by BelSpo project:

SPOT IMAGE. Project supported by PLANET ACTION INITIATIVE. Support by Planet Action to the project through facilitation of 5 to 10 satellite images, and 4 ENVI+IDL licenses valid for one year. <http://www.planet-action.org/web/85-project-detail.php?projectId=4798>

Collaboration with team of Prof. Cadish, University of Höhenheim (Germany)

The team of Prof. Cadish is working in the N-n Vietnam Mountains (Son La Region) on related research topics (land use change and hydrological services). An international conference was organized by his DFG project in July 2010 in Hanoi which the Vietnamese partners assisted. There is regular exchange of ideas with the VGerman team.

- Collaboration with Department of Geography, UQAM Montreal.

Research collaboration with VNU, UQAM (Montreal, Canada) and the UCL (as Belgian French-speaking partner in the project) was established through AUF (Agence Interuniversitaire Francophone). This collaboration focuses at changes in mangrove forests in the Red River delta region. This research collaboration includes an exchange of Vietnamese experts.

----- Ideas for future research-----

WBIGreen : Joint Project proposal on 'Dedicated UAV sensors for high definition mapping of the environment'. Submission of Intent letter (Jan 2012)

Execution

Period: 2010 – 2014

Laboratory/network (promotor names, institutes, mail-adresses, web-site) :

Belgium: (coordinator and divers partners)

Coordinator : Prof. Veerle Vanacker, Earth and Life Institute, TECLIM. Université Catholique de Louvain. Place L. Pasteur, 3. Louvain-la-Neuve. Veerle.vanacker@uclouvain.be (www.uclouvain.be/veerle.vanacker)

Partners :

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Prof Eric Lambin, Earth and Life Institute, TECLIM. Université Catholique de Louvain. Place L. Pasteur, 3. Louvain-la-Neuve. Eric.lambin@uclouvain.be

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Prof. Anton Van Rompaey, Physical Geography Research Group, KULeuven. Celestijnenlaan 200E, 3001 Heverlee, +32 16 326403. anton.vanrompaey@ees.kuleuven.be

Vietnamese partners:

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Discipline (select one or more appropriate disciplines)

Forest & natural vegetation
Agriculture Environment